A Department of Ecology Report

WASHINGTON STATE DEPARTMENT OF ECOLOGY

City of Bremerton Wastewater Treatment Plant Class II Inspection June 21-23, 1999

Abstract

An announced Class II inspection was conducted at the City of Bremerton Wastewater Treatment Plant (WWTP) on June 21-23, 1999. The plant was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well treated, high quality effluent. The effluent met permit limits for BOD_5, TSS, fecal coliform, pH, and total residual chlorine. Split samples showed good agreement between Ecology and Bremerton WWTP sampling and analysis. Six priority pollutant metals were detected in the Bremerton WWTP final effluent composite sample. The copper concentration in the final effluent exceeded both acute and chronic water quality criteria but no reasonable potential for copper to violate water quality standards in the receiving water was found when dilution factors are considered. Other than copper, no metal in the Bremerton WWTP final effluent sample exceeded water quality criteria.

The Puget Sound Naval Shipyard (PSNS) is permitted to contribute wastewater to the Bremerton facility. Twenty-two volatile and fourteen semivolatile organic compounds were found in the PSNS wastewater samples. Of those associated with water quality criteria, all concentrations were close to or below criteria. Eight priority pollutant metals were found in samples of PSNS wastewater. Copper was found in the highest concentration (365 µg/L, total at the WB-3 monitoring vault). The copper concentrations of the PSNS discharges were within permitted limits.

Eight metals were detected in the sludge. All metals in the sludge sample were in concentrations well below EPA Sludge Application Limits and EPA Ceiling Concentrations. The fecal coliform count for the sludge sample was greater than 123,700,000/100g-dry. The EPA Class B sewage sludge limit is 200,000,000/100g-dry. Bremerton reports that as an alternative to pathogen limits, it meets anaerobic digester mean cell residence time and temperature requirements.

by Steven Golding
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Summary

Flow Measurements

The Bremerton totalizing flow meter determines flow from depth in the effluent Parshall flume. The flume is located downstream of the chlorination/dechlorination chamber. The flume was inaccessible and verification of its flow readings, dimensions, and level was not possible. Bremerton reported a flow, verified by Ecology, of 4.80 MGD from 0800 on June 22, 1999 to 0800 on June 23, 1999. Flow at the WB-3 Flow Monitoring Vault was measured by Ecology to have a pro-rated daily flow of 868,000 gpd during the inspection. Flow at the First Street Monitoring Vault was not measured, but is reported to average approximately 150,000 gpd.

NPDES Permit Compliance/General Chemistry

The WWTP was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well treated, high quality effluent. The effluent met permit limits for BOD_5, TSS, fecal coliform, pH, and total residual chlorine. Removal of BOD_5 and TSS during the inspection was 95% and 96% respectively, as compared with required monthly average permitted removals of 85%.

Split Sample Comparison

Samples were split to determine the comparability of Ecology and permittee sampling and laboratory results. Split analyses showed good consistency between Ecology and Bremerton analyses of influent samples for BOD_5 and TSS. The Bremerton influent composite sample was somewhat higher in TSS than the Ecology sample. This is within normal variability, since solids tend to be heterogeneous in municipal influent. Effluent BOD_5 and TSS results showed good agreement between Ecology and Bremerton with all results and analyses agreeing within 3 mg/L.

Priority Pollutant Scans

Organics

Priority pollutant organics analyses were conducted on samples of PSNS wastewater contributions to the Bremerton WWTP. Twenty-two volatile organic analysis (VOA) compounds were found in the PSNS wastewater samples. Of those associated with water quality criteria, all concentrations were well below criteria. Other than acetone, a compound used to clean sampling and analytical equipment, the VOA found in the highest concentration was p-Isopropyltoluene (11 µg/L).

Fourteen semivolatile organics (BNAs) were found in the PSNS wastewater. Other than caffeine, a common compound used as a tracer of domestic wastewater, the semivolatile organic found in the highest concentration was Bis (2-Ethylhexyl)Phthalate (4.8 µg/L est.). Four phthalate compounds were found in concentrations slightly higher than water quality criteria. It should be

noted that water quality criteria apply not to influent wastewaters, but to final effluents in receiving waters after mixing. Of those associated with water quality criteria, all concentrations were well below criteria.

Metals

Six priority pollutant metals were detected in the Bremerton WWTP final effluent composite sample. Copper (8.16 µg/L, total recoverable) exceeded both acute and chronic marine water quality criteria. TSDCALC8, a spreadsheet program developed by the Ecology Water Quality Program, indicates no reasonable potential for copper to violate water quality standards in the receiving water when dilution factors are considered. Other than copper, no metal in the Bremerton WWTP final effluent sample exceeded water quality criteria.

Eight priority pollutant metals were found in samples of PSNS wastewater. Copper (total) was found in the highest concentration (365 µg/L, at the WB-3 monitoring vault, and 61.8 µg/L at the First Street monitoring vault). The copper concentrations of the PSNS discharges were within the 5.2 mg/L (5,200 µg/L) permitted. A mass balance indicates that during the inspection, 68 µg/L total copper in the Bremerton WWTP influent could be expected from PSNS contributions. Antimony, arsenic, lead, nickel, silver, tin, and zinc were also found in higher concentrations in the PSNS wastewater (as total metals) than Bremerton WWTP effluent (as total recoverable metals). Of these, arsenic, lead, and tin were not detected in the Bremerton WWTP effluent.

Sludge

Anaerobically digested sludge is utilized on permitted forest lands owned by the city. Eight metals were detected in the sludge. All metals in the sludge sample were in concentrations well below EPA Sludge Application Limits and EPA Ceiling Concentrations. The fecal coliform count for the sludge sample was greater than 123,700,000/100g-dry (>24,000,000/100g-wet). It could not be determined whether the count was within the EPA Class B sewage sludge limit of 200,000,000/100g-dry. Class B sewage sludge may be applied to forest and agricultural lands with certain restrictions. Bremerton reports that it meets Class B requirements by maintaining required anaerobic digester mean cell residence times and temperatures.

Introduction

An announced Class II inspection was conducted at the City of Bremerton (Bremerton) Wastewater Treatment Plant (WWTP) on June 21-23, 1999. The inspection included sampling the influent and effluent streams and sludge at the Bremerton WWTP, and the wastewater contribution to the plant from the Puget Sound Naval Shipyard. Conducting the inspection were Steven Golding and Norm Glenn of Ecology's Environmental Assessment Program. Assisting from Bremerton were Pat Coxon, Wastewater Treatment Plant Manager, and Jackie Horton, Laboratory Technician. Mike Dawda of Ecology's Northwest Regional Office Water Quality Program requested the inspection.

The city of Bremerton operates a wastewater treatment plant located at the southwest corner of the city. The Bremerton WWTP is a secondary treatment facility serving the City of Bremerton and Kitsap County Sewer District Number 1 (Figure 1). In addition, the facility also receives domestic and industrial wastewater from the Puget Sound Naval Shipyard (PSNS). PSNS discharges wastewater to the Bremerton sewer system at two points, through the WB-3 Flow Monitoring Vault and through the First Street Flow Monitoring Vault. Most of the process water from PSNS flows through the WB-3 Flow Monitoring Vault. Flow through the First Street Flow Monitoring Vault consists mainly of sanitary wastewater. The domestic wastewater from PSNS includes normal non-saline wastewater from the shipyard, as well as wastewater from on-shore chemical toilet facilities and saline wastewater from toilet facilities on ships. The industrial wastewater from PSNS includes pretreated wastewater from the industrial wastewater treatment facility and industrial wastewaters that receive no pretreatment other than pH adjustment in some cases. Sources of industrial wastewater from PSNS include metal finishing facilities (Ecology, 1996a).

Treatment of the liquid stream at the Bremerton WWTP includes screening through mechanical bar screens, grit chambers, primary settling, secondary biological treatment in aeration basins, followed by secondary clarification, disinfection by sodium hypochlorite, and dechlorination by sodium bisulfite. A biofilter at the facility is not being used (Figure 2).

The solids stream treatment components at the facility include a gravity thickener, dissolved air floatation thickener (DAFT), anaerobic digesters, and a centrifuge. The solids removed in the primary clarifiers (primary sludge) are thickened in the gravity thickener. The secondary sludge is thickened in the DAFT. The thickened primary and secondary sludges are digested in two anaerobic digesters. The digested sludge is utilized on permitted forest lands owned by the city. Some of the digested sludge is dewatered in the centrifuge prior to its utilization on the forest lands. The recycle streams, which include gravity thickener supernatant, DAFT underflow, and supernatant from the digesters, are returned to the head of the plant for further treatment.

The dechlorinated effluent is discharged to Sinclair Inlet, Puget Sound. The effluent is discharged through a 36-inch diameter outfall pipe which extends 450 feet offshore and terminates with a 120-foot long diffuser at a depth of approximately 27 feet below mean lower low water (MLLW).

The current NPDES permit #WA-002928-9 was issued to the City of Bremerton on June 21, 1996 and expires on June 21, 2001. A State Waste Discharge Permit was issued to PSNS on June 18, 1996 and expires on June 18, 2001.

Objectives

Objectives of the inspection included:

- Evaluate NPDES permit compliance
- Evaluate plant performance
- Evaluate sampling and laboratory procedures with split samples
- Evaluate influent loading from Puget Sound Naval Shipyard

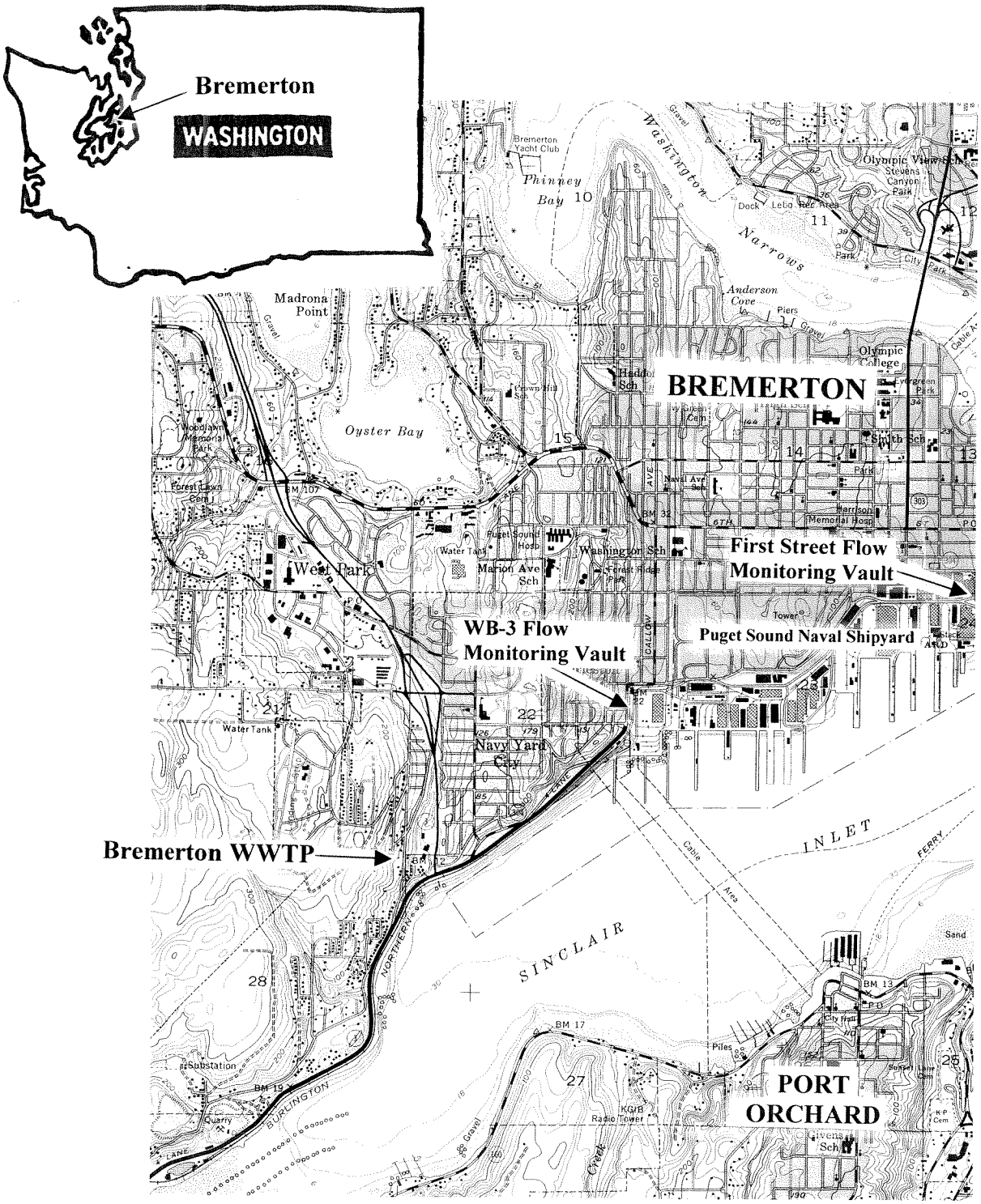

Figure 1 - Location Map - Bremerton WWTP, June 1999.

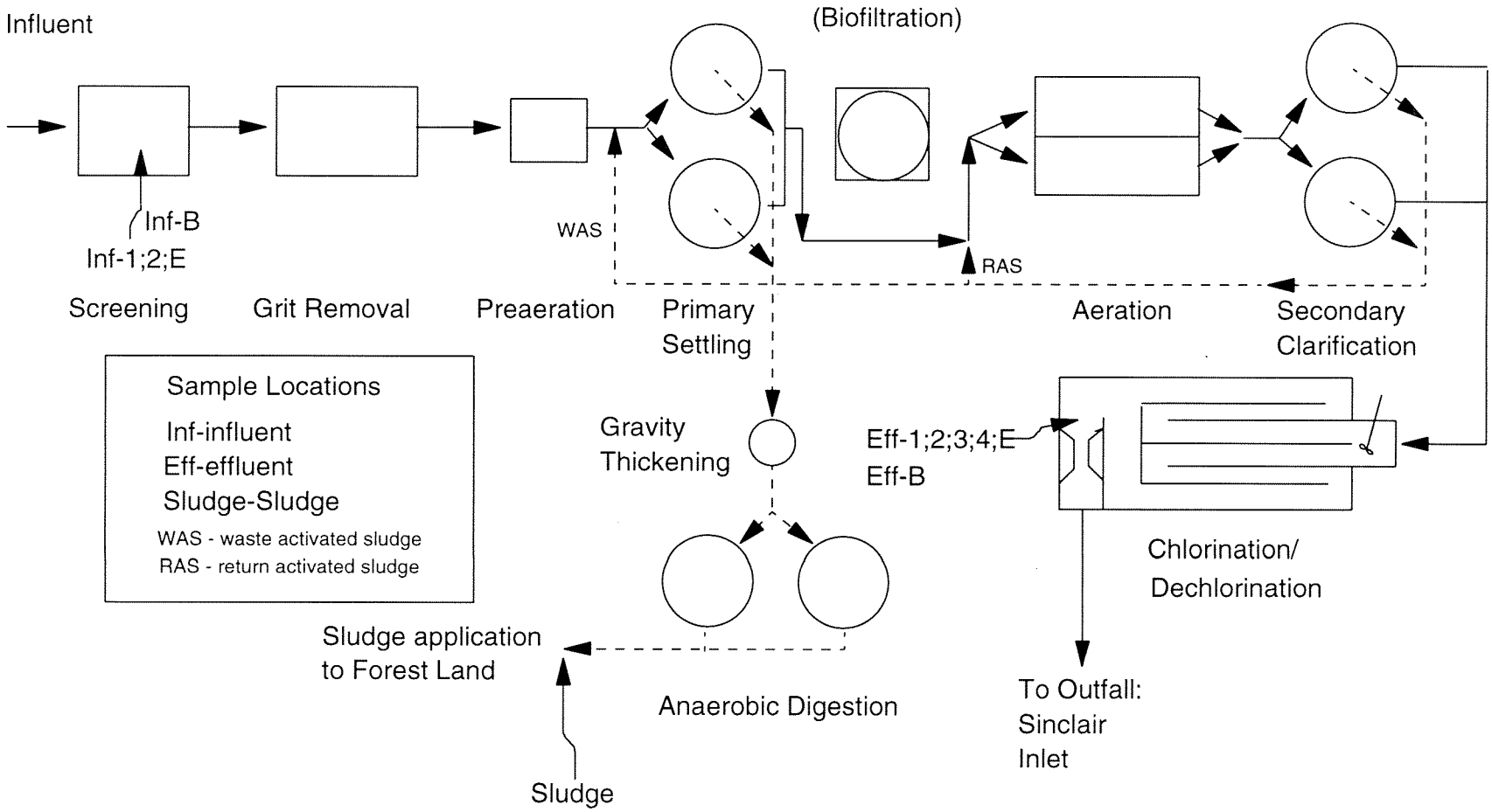

Figure 2 - Flow Schematic - Bremerton WWTP, June 1999.

Methods

Ecology verified plant flow during the inspection by noting plant flowmeter totalizer readings on the morning of June 22 and on the morning of June 23 and calculating a prorated 24-hour flow. Flow at the WB-3 Flow Monitoring Vault was read from an inline flow meter installed and maintained by Bremerton.

Composite samples were collected by Ecology at influent (Inf) and final effluent (Eff) locations at the WWTP. Grab samples were collected by Ecology at influent (Inf), final effluent (Eff), and sludge (Sludge) locations. Composite samples of wastewater contributions from PSNS were collected by Ecology at the WB-3 Flow Monitoring Vault (Navy1) and the First Street Flow Monitoring Vault (Navy2). Ecology conducted field measurements on all except sludge and Navy2-E samples. Bremerton collected composite samples of influent (Inf-B) and final effluent (Eff-B).

Ecology Isco portable composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. The samples were then divided into subsamples for analysis. The compositors were iced to preserve samples. The composite influent and effluent samplers operated by Bremerton were set to collect equal volumes of sample every hour for 24 hours. The samples were kept refrigerated during sampling.

Ecology influent and effluent composite samples and Bremerton influent and effluent composite samples were split for both Ecology and Bremerton laboratory analysis. Sampler locations are shown in Figure 2 and sampler station descriptions appear in Appendix A. The sampling schedule, parameters analyzed, and sample splits are included in Appendix B. Ecology analytical methods and laboratories performing the analyses are summarized in Appendix C. Ecology field and laboratory QA/QC are summarized in Appendix D. Quality Assurance cleaning procedures are included in Appendix E. A glossary appears in Appendix G.

Results and Discussion

Flow Measurements

The Bremerton totalizing flow meter determines flow from depth in the effluent Parshall flume. The flume is located downstream of the chlorination/dechlorination chamber. The flume was inaccessible and verification of its flow readings, dimensions, and level was not possible. The Milltronics meter measures depth in the flume with an ultrasonic sensor which, according to the manufacturer, has no drift and needs no periodic calibration. However, plant personnel should calibrate the meter at least once per year, as required by permit.

Bremerton reported a flow of 4.80 MGD from 0800 on June 22, 1999 to 0800 on June 23, 1999. Ecology verified this reported flow, finding a flow of 4.645 MGD from 0755 on June 22, 1999 to 0829 on June 23, 1999. This corresponds to a pro-rated daily flow of 4.76 MGD.

Flow at the WB-3 Flow Monitoring Vault was measured by Ecology to be 110,200 cubic feet from 1012 on June 22, 1999 to 0900 on June 23, 1999. This corresponds to a pro-rated daily flow of 868,000 gpd. Flow at the First Street Monitoring Vault was not measured, but is reported to average approximately 150,000 gpd (Pham, 1998).

NPDES Permit Compliance / General Chemistry

The WWTP was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well treated, high quality effluent (Table 1). The effluent met permit limits for BOD_5, TSS, fecal coliform, pH, and total residual chlorine (Table 2). Removal of BOD_5 and TSS during the inspection was 95% and 96% respectively, as compared with required monthly average permitted removals of 85%. There are no permit limits for flow but the permitted BOD_5 and TSS loadings are based on the maximum monthly average design flow of 10.1 MGD.

Ammonia (NH_3) concentrations were higher in the effluent samples than in the influent samples, indicating that nitrification was not taking place. The negligible increase in nitrite-nitrate (NO_2 + NO_3-N) across the plant is consistent with this. Effluent alkalinity (180 mg/L) is sufficient so as not to limit nitrification. The apparent increase in ammonia across the plant may be the result of a non-steady state condition, with variable influent ammonia loading. No permit limits apply to effluent ammonia for the Bremerton WWTP, and nitrification is not required.

Split Sample Comparison

Samples were split to determine the comparability of Ecology and permittee sampling and laboratory results (Table 3). Split analyses showed good consistency between Ecology and Bremerton analyses of the Ecology and Bremerton influent samples with an average relative percent difference (RPD) of 6% for both BOD_5 and TSS. RPD is calculated by dividing the absolute value of the difference between the data results by the average of the results. While Ecology and Bremerton analyses compared closely, some differences were apparent between the Ecology and Bremerton influent composite sample. The Bremerton influent sample was somewhat higher in TSS than the Ecology sample, with an RPD of 18% between the two. This is within normal variability, since solids tend to be heterogeneous in municipal influent. Effluent BOD_5 and TSS results showed good agreement between Ecology and Bremerton, with all results and analyses agreeing within 3 mg/L.

Influent and effluent Bremerton composite sample containers were removed from refrigerated compartments at the sampling sites and stored at room temperature for approximately two hours before Ecology obtained samples from them and placed the samples with ice in ice chests. Ecology measured temperatures of 10.2°C and 10.8°C respectively at the time samples from these containers were obtained. These temperatures are higher than the 4°C allowable maximum holding temperature. Temperatures that are higher than allowable can result in degradation of the sample prior to analyses, accompanied by lower BOD_5 results. Ecology analyses found a lower BOD_5 result for the Bremerton influent sample than for the Ecology influent sample.

Table 1. General Chemistry Results - Bremerton, June 1999.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-B
	Type:	grab	grab	comp	comp
	Date:	6/22	6/22	6/22-23	6/22-23
	Time:	0810	1435	0800-0800	0800-0800
	Lab Log #:	258230	25823 1	258232	258233
Conductivity (umhos/cm)		3200	5200	3610	3760
Salinity (g/Kg ww)					
Alkalinity (mg/L)				157	152
Hardness (mg/L)				348	367
TS (mg/L)				2190	2350
TNVS (mg/L)				1700	1800
TSS (mg/L)		130	161	151	185
TNVSS (mg/L)				22J	21J
% Solids					
% Volatile Solids					
BOD5 (mg/L)				219	200
TOC (water - mg/L)		52.9	66.0	63.6	58.7
NH3-N (mg/L)		17.6	20.6	19.0	18.0
NO2+NO3-N (mg/L)		0.034	0.015	0.010	0.010
Total-P (mg/L)		3.78	4.43	0.010	0.010
F-Coliform MF (#/100mL)					
F-Coliform (#/100g)					
Cobalt 60 (pCi/g)					
FIELD OBSERVATIONS					
Temperature (C)		16.5	17.7	4.8	10.2
pH		7.05	7.1		
Conductivity (umhos/cm)		3200	5200	3740	3930
Chlorine (mg/L)					
Free					
Total					

Inf - influent
E - Ecology sample
B - Bremerton sample

grab - grab sample
comp - composite sample
J - estimated result

Table 1. Bremerton, June 1999 (cont'd).

Parameter	Locatn:	Eff-1	Eff-2	Eff-E	Eff-B	Eff-3	Eff-4	Sludge	Navy1-E	Navy1-1	Navy2-E	Navy2-1	TrnsBlnk
	Type:	grab	grab	comp	comp	grab	grab	grab	comp	grab	comp	grab	grab
	Date:	6/22	6/22	6/22-23	6/22-23	6/22	6/22	6/22	6/22-23	6/22	6/22-23	6/22	6/21
	Time:	0835	0300	0800-0800	0800-0800	0815	1110	0935	0800-0800	1012	0800-0800	1050	1145
	Lab Log #:	258234	258235	258236	258237	258238	258239	258240	258241	258242	258243	258244	258245
Conductivity (umhos/cm)		4010	3710	4170	4110								
Salinity (g/Kg ww)				1.0					5.0		0.2U		
Alkalinity (mg/L)				180	175								
Hardness (mg/L)				389	386				1000		257		
TS (mg/L)				2320	2300				6470		1470		
TNVS (mg/L)				1930	1950				5210		1180		
TSS (mg/L)		8	6	6	9		10		143		40		
TNVSS (mg/L)				1J	2J				16J		8J		
% Solids								19.4					
% Volatile Solids								13					
BOD5 (mg/L)				11	11								
TOC (water - mg/L)		16.8	14.7	15.0	15.0								
NH3-N (mg/L)		32.6	28.5	27.3	25.3								
NO2+NO3-N (mg/L)		0.229	0.280	0.240	0.398								
Total-P (mg/L)		4.22	3.16	3.32	3.36								
F-Coliform MF (#/100mL)						3	3						
F-Coliform (#/100g)								>24,000,000					
Cobalt 60 (pCi/g)								ND					
FIELD OBSERVATIONS													
Temperature (C)		17.7	18.8	5.5	10.8				10.6	19.7		18.3	
pH		7.4	7.3							7.4		8.3	
Conductivity (umhos/cm)		4100	3680	4420	4290				10,630	8530		803	
Chlorine (mg/L)													
Free	<0.1					0.6*	1.5*	*upstream of					
Total	<0.1					0.7*	1.5*	dechlorination					

Eff - effluent
Sludge - sludge
TrnsBlnk - transfer blank
grab - grab sample
comp - composite sample

J - estimated result

Navy1 - Puget Sound Naval Shipyard
WB-3 Flow Monitoring Vault

Navy2 - Puget Sound Naval Shipyard
First Street Flow Monitoring Vault

Table 2. NPDES Permit Limits and Inspection Results – Bremerton WWTP, June 1999.

	NPDES Limits		Inspection Results	
Parameter	Monthly Average	Weekly Average	Composite Samples	Grab Samples
BOD5	30 mg/L 2,527 lbs/day 85% removal	45 mg/L 3,790 lbs/day	11 mg/L 440 lbs/day* 95% removal	
TSS	30 mg/L 2,527 lbs/day 85% removal	45 mg/L 3,790 lbs/day	6 mg/L 240 lbs/day* 96% removal	
Fecal Coliform	200/100 mL	400/100 mL		3/100 mL 3/100 mL
pH	6.0 to 9.0 (continuous)			7.4; 7.3
	Monthly Average	Maximum Daily		
Total Residual Chlorine	0.13 mg/L	0.37 mg/L		<0.1

* based on totalizer reading of 4.80 MGD for 8 AM 06-22-99 to 8 AM 06-23-99.

Table 3. Split Sample Results Comparison - Bremerton, June 1999.

	Location:	Inf-E	Inf-B	Eff-E	Eff-B
	Type:	comp	comp	comp	comp
	Date:	6/22-23	6/22-23	6/22-23	6/22-23
	Time:	0800-0800	0800-0800	0800-0800	0800-0800
	Lab Log #:	258232	258233	258236	258237
	Sampled by:	Ecology	Bremerton	Ecology	Bremerton
Parameter	Analysis by:				
BOD_5 (mg/L)					
	Ecology	219	200	11	11
	Bremerton	198	203	9	8
TSS (mg/L)					
	Ecology	151	185	6	9
	Bremerton	164	193	8	11

Inf - influent sample
Eff - effluent sample

comp - composite sample

E - Ecology sample
B - Bremerton sample

Ecology analyses showed a higher TSS concentration in the Bremerton influent sample than in the Ecology influent sample. Ordinarily, a sample from a given municipal wastewater with higher TSS also tends to have higher BOD_5 since BOD_5 is associated in large part with solids particles. The finding of a higher TSS but a lower BOD_5 in the Bremerton influent sample supports the view that degradation of the sample may have occurred. It should be noted that Bremerton analyses of the two influent samples showed an opposite trend, with the Bremerton influent sample having a slightly higher BOD_5 than the Ecology influent sample. A comparison of Ecology and Bremerton analyses of Ecology and Bremerton effluent samples shows no significant difference in BOD_5 results (Table 3).

Priority Pollutant Scans

Organics

Priority pollutant organics analyses were conducted on samples of PSNS wastewater contributions to the Bremerton WWTP. Twenty-two volatile organic analysis (VOA) compounds were found in the PSNS wastewater samples. Of those associated with water quality criteria, all concentrations were well below criteria (Table 4). Other than acetone, a compound used to clean sampling and analytical equipment, the VOA found in the highest concentration was p-Isopropyltoluene (11 µg/L).

Fourteen semivolatile organic compounds (BNAs) were found in the PSNS wastewater sample. Dimethyl Phthalate (3 µg/L est.) was found at a concentration exceeding the acute marine water quality criterion of 2.944 µg/L. Di-n-Butyl Phthalate (4.3 µg/L est.), Butlbenzyl Phthalate (3.5 µg/L est.), and Bis (2-Ethylhexyl)Phthalate (4.8 µg/L est.) were found in concentrations exceeding acute and chronic marine water quality criteria of 2.944 µg/L and 3.4 µg/L respectively (Table 4). It should be noted that while a comparison of wastewater concentrations with water quality criteria provides some perspective, water quality criteria apply not to influent wastewaters but rather to final effluent discharges after mixing in receiving waters. Other than caffeine, a common compound used as a tracer of domestic wastewater, the semivolatile organic compound found in the highest concentration was Bis (2-Ethylhexyl)Phthalate (4.8 µg/L est.).

Metals

Priority pollutant metals analyses were conducted on samples of Bremerton WWTP final effluent and sludge as well as PSNS wastewater contributions to the Bremerton WWTP. Six priority pollutant metals were detected in the Bremerton WWTP final effluent composite sample (Table 4). Of these, zinc was found in the highest concentration (14.2 µg/L est., total recoverable). Copper in the Bremerton effluent sample (8.16 µg/L) exceeds both acute and chronic water quality criteria. Based on dilution factors of 25:1 at the acute and 69:1 at the chronic mixing zone boundaries (Ecology, 1996b), and a probability of achieving water quality standards of 95%, TSDCALC8 (a spreadsheet program developed by Ecology's Water Quality Program) indicates no reasonable potential for copper to violate water quality standards. The calculated copper concentration at the edge of the acute mixing zone is 1.7 µg/L, compared with an acute criterion of 4.8 µg/L. For the chronic mixing zone boundary, a calculated copper concentration of 0.61 compares with a chronic criterion of 3.1 µg/L. Other than copper, no metal in the Bremerton WWTP final effluent sample exceeded water quality criteria.

Table 4. VOA, BNA, and Metals Scan Results – Bremerton, June 1999.

Location:	Navy1-1	Navy2-1	EPA/Ecology Water Quality Criteria Summary	
Type:	grab	grab		
Date:	6/22	6/22	Acute	Chronic
Time:	1012	1050	Marine	Marine
Lab Log#:	258242	258244		
VOA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Acetone	38 J			
Carbon Disulfide	1 J			
2-Methyoxy-2-Methylpropane	10			
2-Butanone (MEK)	5.1			
Chloroform	4.7	6.2	12,000 *(a)	6,400 *(a)
1,1,1-Trichloroethane	0.25 J		31,200 *	
Benzene	1.3		5,100 *	700 *
Trichloroethene	0.6 J	0.28 J	2,000 *	
Bromodichloromethane	0.25 J		12,000 *(a)	6,400 *(a)
4-Methyl-2-Pentanone (MIBK)	1 J			
Toluene	5.9	0.5 J	6,300 *	5,000 *
Tetrachloroethene	0.6 J	0.26 J	10,200 *	450 *
Ethylbenzene	0.67 J		430 *	
m&p-Xylene	1.8 J			
o-Xylene	1.3			
n-Propylbenzene	0.19 J			
1,3,5-Trimethylbenzene	0.61 J			
1,2,4-Trimethylbenzene	1.9			
p-Isopropyltoluene	11			
1,4-Dichlorobenzene	0.88 J	0.4 J	1,970 *(h)	
n-Butylbenzene	0.7 J			
Naphthalene	5.2 J	1.6 J		

J - The analyte was positively identified. The associated numerical value is an estimate.

Inf - influent sample
Eff - effluent sample
grab - grab sample

a Total Halomethanes
h Total Dichlorobenzenes

Table 4. Bremerton, June 1999 (cont'd).

Location:	Navy1-E		
Type:	comp		EPA/Ecology Water Quality Criteria Summary
Date:	6/22-23	Acute	Chronic
Time:	0800-0800	Marine	Marine
Lab Log#:	258241		
BNA Compounds	(ug/L)	(ug/L)	(ug/L)
Phenol	1.1 J	5,800 *	
1,4-Dichlorobenzene	0.35 J	1,970 *(h)	
Benzyl Alcohol	1.2 J		
4-Methylphenol	12 J		
2,4-Dimethylphenol	0.49 J		
Naphthalene	0.48 J	2,350 *	
2-Methylnaphthalene	0.33 J		
1-Methylnaphthalene	0.28 J		
Dimethyl Phthalate	0.11 J	2.944 *(i)	3.4 *(i)
Diethyl Phthalate	3 J	2.944 *(i)	3.4 *(i)
Caffeine	12 J		
Di-n-Butyl Phthalate	4.3 J	2.944 *(i)	3.4 *(i)
Butylbenzyl Phthalate	3.5 J	2.944 *(i)	3.4 *(i)
Bis(2-Ethylhexyl)Phthalate	4.8 J	2.944 *(i)	3.4 *(i)

J - The analyte was positively identified. The associated numerical value is an estimate.

E-comp - Ecology composite sample
grab - grab sample
comp - composite sample
Inf - influent
Eff- final effluent

h total Dichlorobenzenes
i total Pthalate Esters

Table 4. Bremerton, June 1999 (cont'd).

Location:	Eff-E	Navy1-E	Navy2-E	TrnsBlnk	EPA/Ecology Water Quality Criteria	
Type:	comp	comp	comp	grab		
Date:	6/22-23	6/22-23	6/22-23	6/21	Acute	Chronic
Time:	0800-0800	0800-0800	0800-0800	1145	Marine	Marine
Lab Log#:	258236	258241	258243	258245		
	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Metals	(Total Recoverable)	(Total)	(Total)	(Total)	(Total Recoverable)	
Antimony	0.66	2.6	1.8			
Arsenic		2			69	36
Pentavalent						
Trivalent						
Beryllium						
Cadmium					42.0	9.3
Chromium	3.0					
Hexavalent					1,100	50
Trivalent					10,300	
Copper	8.16	365	61.8	0.61	4.8	3.1
Lead		2.2	3.5		210	8.1
Mercury (total)					1.8	0.025
Nickel	8.02	41.1	4.8		74	8.2
Selenium					290	71
Silver	0.52	3.0			1.9	
Thallium					2130*	
Tin		16 J				
Zinc	14.2 J	173	102		90	81

Eff - Effluent
E - Ecology sample
Trnsblk - transfer blank
grab - grab sample
comp - composite sample
Navy1- Puget Sound Naval Shipyard WB-3 Flow Monitoring Vault
Navy2 - Puget Sound Naval Shipyard First Street Monitoring Vault
* Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.
J - The analyte was positively identified. The associated numerical value is an estimate.

Eight priority pollutant metals were found in samples of PSNS wastewater (Table 4). Copper (total) was found in the highest concentration (365 µg/L at the WB-3 monitoring vault and 61.8 µg/L at the First Street monitoring vault). PSNS holds a State permit to discharge to the Bremerton WWTP. The copper concentrations of the PSNS discharges were within the 5.2 mg/L (5,200 µg/L) monthly average and daily maximum permitted for the WB-3 and First Street monitoring vaults. A mass balance indicates that during the inspection, 68 µg/L total copper in the Bremerton WWTP influent could be attributed to the combined contributions of the two PSNS wastewater sources. Because metals including copper tend to become incorporated in sludge solids, most of the copper would be expected to be removed by the Bremerton WWTP. Although the Bremerton WWTP influent was not analyzed for metals during the inspection, past Class II inspections of activated sludge plants in the State of Washington have found reductions in copper across WWTPs consistent with a reduction in copper across the Bremerton WWTP from 68 µg/L total copper to 8.16µg/L total recoverable copper.

Antimony, arsenic, lead, nickel, silver, tin, and zinc were also found in higher concentrations in the PSNS wastewater (as total metals) than Bremerton WWTP effluent (as total recoverable metals). Of these, arsenic, lead, and tin were not detected in the Bremerton WWTP effluent. The results of total recoverable metals analyses tend to be somewhat lower than for total metals since the digestion process employed for the method is not as complete.

Sludge

Sludge is digested anaerobically at the facility. The digested sludge is utilized on permitted forest lands owned by the city. The sludge sample contained 19.4 % solids and 13% volatile solids (Table 1). No detectable Cobalt 60, an isotope associated with some shipyards servicing onboard nuclear reactors, was found in the sludge. Eight metals were detected in the sludge (Table 5). All metals in the sludge sample were in concentrations well below EPA Sludge Application Limits and EPA Ceiling Concentrations. The fecal coliform count for the sludge sample was greater than 123,700,000/100g-dry (>24,000,000/100g-wet - Table 1). Because the fecal coliform count was reported not as equal to a value, but instead greater than 123,700,000/100g-dry, it could not be determined whether the count was within the EPA Class B pathogen limit of 200,000,000/100g-dry (EPA, 1993). The Class B pathogen requirements pertain to sewage sludge applied to forest and agricultural lands. As an alternative to bacteriological monitoring, the Class B pathogen requirement can be met by maintaining anaerobic digestion at 35°C to 55°C with a mean cell residence time of 15 days or more. Bremerton reports that it meets this requirement (Coxon, 1999).

Recommendations

As required by permit, the effluent flow meter should be calibrated at the manufacturer's recommended interval or at least once per year.

Table 5. Sludge Metals and Comparison with EPA Criteria for Land Application - Bremerton, June 1999.

Location:	Sludge		
Type:	grab	EPA Sludge	
Date:	6/22	Application Limits	EPA Ceiling
Time:	0935	(monthly avg.)	Concentrations
Lab Log #:	258240		
	mg/Kg-dry	mg/Kg-dry	mg/Kg-dry
Metals (total)			
Antimony	8 U		
Arsenic	0.6 U	41	75
Beryllium	0.2 U		
Cadmium	1 U	39	85
Chromium	16.1	1200	3000
Copper	219	1500	4300
Lead	8.59	300	840
Mercury	2.12	17	57
Nickel	40.9	420	420
Selenium	0.87	36	100
Silver	14.3		
Thallium	0.6 U		
Zinc	247	2800	7500

Sludge - sludge sample
grab - grab sample
U - The analyte was not detected at or above the reported result.

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Appendix A.

Sampling Station Descriptions - Bremerton, June 1999

Ecology influent grab and composite samples (Inf-1,2; Inf-E)

The influent grab and composite samples were taken from the influent box (before degritting) in a well mixed flow region. The compositor was set outside of the door to the building housing the influent box to eliminate the risk of explosion. A stainless steel strainer was attached to the end of the compositor's intake line and the strainer was placed 1 foot below the water surface.

Bremerton influent composite sample (Inf-B)

The influent composite sample was taken from a sample line in the influent box (before degritting) in a well mixed flow region.

Ecology effluent grab and composite samples (Eff-1,2; Eff-E)

Effluent grab and composite samples were taken at the upstream end of the Parshall flume at the end of the chorination basin (after dechlorination). A stainless steel strainer was attached to the end of the compositor's intake line and the strainer was placed 1 foot below the water surface. Eff-3 and Eff-4 samples for chlorine were taken before dechlorination as indicated in Table 1.

Bremerton effluent composite sample (Eff-B)

The effluent composite sample was taken at the upstream end of the Parshall flume at the end of the chlorination basin (after dechlorination).

Ecology sludge sample (Sludge)

The sludge sample was collected after dewatering as it was being loaded onto a truck. A polyethylene scoop dedicated for sludge sampling at the plant but not cleaned prior to sampling was used to obtain the samples.

Puget Sound Naval Shipyard WB-3 Flow Monitoring Vault (Navy 1-E; Navy 1-1)

Bremerton has a permanent composite sampler installed in the monitoring vault to sample wastewater contributions from the Naval Shipyard. Bremerton's refrigerated sampler was used for sampling because the flow was not accessible. Bremerton installed clean tubing prior to the inspection and Ecology placed a cleaned 5 gallon jar in the sampler. Grab samples were pumped through the sampler line.

Puget Sound Naval Shipyard First Street Flow Monitoring Vault (Navy 2-E; Navy 2-1)

Bremerton has a permanent composite sampler installed in the monitoring vault to sample wastewater contributions from the Naval Shipyard. Bremerton's refrigerated sampler was used for sampling because the flow was not accessible. Bremerton installed clean tubing prior to the inspection. The Ecology collection jar would not fit in the sampler, so the Bremerton polyethylene collection jar was used.

Transfer Blank (TrnsBlnk)

A transfer blank was collected before sampling began by attaching a cleaned stainless steel strainer to the end of the cleaned Eff-E compositor. The strainer was immersed in DI blank water obtained from the Manchester Laboratory and blank water was pumped through the compositor into a metals collection bottle.

Appendix B. Sampling Schedule - City of Bremerton, June 1999.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-B
	Type:	grab	grab	comp	comp
	Date:	6/22	6/22	6/22-23	6/22-23
	Time:	0810	1435	0800-0800	0800-0800
	Lab Log #:	258230	258231	258232	258233
Conductivity (umhos/cm)		E	E	E	E
Salinity (g/Kg ww)					
Alkalinity (mg/L)				E	E
Hardness (mg/L)				E	E
TS (mg/L)				E	E
TNVS (mg/L)				E	E
TSS (mg/L)		E	E	EB	E
TNVSS (mg/L)				E	E
% Solids					
% Volatile Solids					
BOD5 (mg/L)				EB	E
TOC (water - mg/L)		E	E	E	E
NH3-N (mg/L)		E	E	E	E
NO2+NO3-N (mg/L)		E	E	E	E
Total-P (mg/L)		E	E	E	E
F-Coliform MF (#/100mL)					
F-Coliform (#/100g)					
Cobalt 60 (pCi/g)					
FIELD OBSERVATIONS					
Temperature (C)		E	E	E	E
pH		E	E		
Conductivity (umhos/cm)		E	E	E	E
Chlorine (mg/L)					
Free					
Total					

Inf - influent

Eff - effluent

- E - Ecology sample
- B - Bremerton sample

E - Ecology analysis

B - Bremerton analysis

Appendix B. Bremerton, June 1999 (cont'd).

Locatn:	Eff-1	Eff-2	Eff-E	Eff-B	Eff-3	Eff-4	Sludge	Navy1-E	Navy1-1	Navy2-E	Navy2-1	TrnsBlnk
Type:	grab	grab	comp	comp	grab	grab	grab	comp	grab	comp	grab	grab
Date:	6/22	6/22	6/22-23	6/22-23	6/22	6/22	6/22	6/22-23	6/22	6/22-23	6/22	6/21
Time:	0835	0300	0800-0800	0800-0800	0815	1110	0935	0800-0800	1012	0800-0800	1050	1145
Lab Log #:	258234	258235	258236	258237	258238	258239	258240	258241	258242	258243	258244	258245
Conductivity (umhos/cm)	E	E	E	E								
Salinity (g/Kg ww)			E					E		E		
Alkalinity (mg/L)			E	E								
Hardness (mg/L)			E	E				E		E		
TS (mg/L)			E	E				E		E		
TNVS (mg/L)			E	E				E		E		
TSS (mg/L)	E	E	EB	E		E		E		E		
TNVSS (mg/L)			E	E				E		E		
% Solids							E					
% Volatile Solids							E					
BOD5 (mg/L)			EB	E								
TOC (water - mg/L)	E	E	E	E								
NH3-N (mg/L)	E	E	E	E								
NO2+NO3-N (mg/L)	E	E	E	E								
Total-P (mg/L)	E	E	E	E								
F-Coliform MF (#/100mL)					E	E						
F-Coliform (#/100g)							E					
Cobalt 60 (pCi/g)							E					
FIELD OBSERVATIONS												
Temperature (C)	E	E	E	E				E	E	E		
pH	E	E							E	E		
Conductivity (umhos/cm)	E	E	E	E				E	E	E		
Chlorine (mg/L)												
Free	E				E*	E*	*upstream of					
Total	E				E*	E*	dechlorination					

Navy1 - Puget Sound Naval Shipyard
WB-3 Flow Monitoring Vault
Navy2 - Puget Sound Naval Shipyard
First Street Flow Monitoring Vault

Appendix C. Ecology Analytical Methods - Bremerton, June 1999.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
Conductivity	EPA, Revised 1983: 120.1	Manchester Laboratory
Salinity	APHA, 1992: 2520	Manchester Laboratory
Alkalinity	EPA, Revised 1983: 310.1	Manchester Laboratory
Hardness	EPA, Revised 1983: 130.2	Manchester Laboratory
TS	EPA, Revised 1983: 160.3	Manchester Laboratory
TNVS	EPA, Revised 1983: 160.3	Manchester Laboratory
TSS	EPA, Revised 1983: 160.2	Manchester Laboratory
TNVSS	EPA, Revised 1983: 160.2	Manchester Laboratory
% Solids	APHA, 1992: 2540G.	Manchester Laboratory
% Volatile Solids	EPA, Revised 1983: 160.4	Manchester Laboratory
BOD5	EPA, Revised 1983: 405.1	Manchester Laboratory
TOC (water)	EPA, Revised 1983: 415.1	Manchester Laboratory
TOC (soil/sed)	EPA, Revised 1983: 415.1	Manchester Laboratory
NH3-N	EPA, Revised 1983: 350.1	Manchester Laboratory
NO2+NO3-N	EPA, Revised 1983: 353.2	Manchester Laboratory
Total-P	EPA, Revised 1983: 365.3	Manchester Laboratory
F-Coliform MF	APHA, 1992: 9222D.	Manchester Laboratory
F-Coliform (soil/sed)	APHA, 1989: 9221A.	Manchester Laboratory
Cobalt 60	Quanterra-RICHRC5017 (EPA 901.1)	Quanterra, Inc., Richland WA
VOC (water)	EPA, 1986: 8260	Manchester Laboratory
BNAs (water)	EPA, 1986: 8270	Manchester Laboratory
PP Metals (water)	EPA, Revised 1983: 200-299	Manchester Laboratory
PP Metals (soil/sed)	EPA, Revised 1983: 200-299	Manchester Laboratory

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Appendix D.

Quality Assurance/Quality Control (QA/QC) - Bremerton, June 1999

SAMPLING QA/QC

Ecology quality assurance procedures for sampling included cleaning of the sampling equipment for priority pollutant metals and organics analysis prior to the inspection to prevent sample contamination (Appendix F). Chain-of-custody procedures were followed to assure the security of the samples (Ecology, 1994).

Influent and effluent Bremerton composite sample containers were removed from refrigerated compartments at the sampling sites and stored at room temperature for approximately two hours before Ecology obtained samples from them and placed the samples with ice in ice chests. Ecology measured temperatures of 10.2°C and 10.8°C respectively at the time Ecology obtained samples from these containers. These temperatures are higher than the 4°C allowable maximum holding temperature. Higher than allowable temperatures can result in degradation of the sample prior to analyses. Degradation of sample can lead to lower BOD_5 results. As discussed in the section, "Split Sample Comparison," it appears that there may have been some degradation of the Bremerton influent composite sample (Inf-B). Sample degradation appears to have had no significant effect on analytical results from the Bremerton effluent sample (Eff-B).

LABORATORY QA/QC

The general chemistry data generated by the analysis of the samples can be used noting the qualifications given to the data. Fecal coliform (MPN) for sample 258240 is qualified as greater than the reported result. Fecal coliform (MF) for sample 258239 was not analyzed due to laboratory accident. Samples were received in good condition. All analyses were performed within holding times. All calibration verifications were within control standards. A correlation coefficient of 0.995 or greater was met. Procedural blanks showed no significant analytical levels of analytes. All spike recoveries were within limits. Spike sample and duplicate sample results were within acceptance windows. Laboratory control samples were within the windows established for each parameter.

Quanterra reported that in analyzing for Cobalt 60, the contractual Minimum Detectable Activity (MDA) value of 0.2 pCi/gram was not met at 0.21 pCi/fram due to the small amount of sample available for analysis. Except as noted, the LCS, Batch blank, sample duplicate, and sample results met the requirements of the contract.

Metals data for liquid samples for this project met all QA/QC criteria with the following exceptions. Lead and selenium recoveries were low for both the spike and duplicate spike in the Total Recoverable (TR) samples. Zinc showed potential blank contamination in the TR samples. Tin had no spike recoveries nor LCS recovery in the total digestion. All the noted data is qualified as estimated (J) or estimated but undetected (UJ). Metals data for the sludge sample met all QA/QC criteria and can be used without qualification.

Volatile Organic Analysis (VOA) data are usable as reported. Low levels of certain target compounds were detected in the laboratory blanks. Surrogate recoveries were within acceptable limits. Samples were analyzed withing the recommended 14 day holding time. Matrix spike recoveries were within acceptable limits with two notable exceptions. The curve was unreliable for Acetone. The spike recoveries were not calculated (qualifier "NC") and the corresponding sample result is qualified as an estimate of this compound. Naphthalene recoveries were higher than usual. Therefore the detected result for this compound has been qualified as an estimate in the corresponding sample.

Semivolatile Organics (BNAs) were analyzed with no cleanup of the extracts necessary. The samples were extracted and analyzed within recommended holding times. Low levels of some analytes were detected in the laboratory blanks. Surrogate recoveries were low in the sample requiring qualification of the data. Matrix spikes were not analyzed. The BNA data is acceptable for use as reported.

LABORATORY AUDIT

The Bremerton laboratory was accredited on June 26, 1992 and renewed most recently on July 1, 1999. The current accreditation expires on June 30, 2000.

Appendix E.

Priority Pollutant Cleaning Procedures -Bremerton, June 1999

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity acetone
6. Rinse with high purity hexane
7. Allow to dry and seal with aluminum foil

Appendix F. OA, BNA, and Metals Scan Results - Bremerton, June 1999.

Location:	Navy1-1	Navy2-1
Type:	grab	grab
Date:	6/22	6/22
Time:	1012	1050
Lab Log#:	258242	258244
VOA Compounds		
Dichlorodifluoromethane	2 U	2 U
Chloromethane	2 U	2 U
Vinyl Chloride	1 U	1 U
Bromomethane	1 U	1 U
Chloroethane	5 U	5 U
Trichlorofluoromethane	2 U	2 U
1,1,2 Trichlorotrifluoroethane	1 U	1 U
Ethyl Ether	1 U	1 U
1,1-Dichloroethene	1 U	1 U
Methyl Iodide	1 U	1 U
Acetone	**38 J**	40 U
Carbon Disulfide	**1 J**	2 U
Methylene Chloride	2 U	2 U
2-Methyoxy-2-Methylpropane	**10**	1 U
trans-1,2-Dichloroethene	1 U	1 U
1,1-Dichloroethane	1 U	1 U
2-Butanone (MEK)	**5.1**	2 U
cis-1,2-Dichloroethene	1 U	1 U
2,2-Dichloropropane	1 U	1 U
Bromochloromethane	1 U	1 U
Chloroform	**4.7**	**6.2**
Tetrahydrofuran	1 U	1 U
1,1,1-Trichloroethane	**0.25 J**	1 U
1,1-Dichloropropene	1 U	1 U
Carbon Tetrachloride	1 U	1 U
1,2-Dichloroethane	1 U	1 U
Benzene	**1.3**	1 U
Trichloroethene	**0.6 J**	**0.28 J**
1,2-Dichloropropane	1 U	1 U
Dibromomethane	1 U	1 U
Bromodichloromethane	**0.25 J**	1 U
cis-1,3-Dichloropropene	1.1 U	1.1 U
4-Methyl-2-Pentanone (MIBK)	**1 J**	2 U
Toluene	**5.9**	**0.5 J**
trans-1,3-Dichloropropene	0.94 U	0.94 U
1,1,2-Trichloroethane	1 U	1 U

Navy1 - Puget Sound Naval Shipyard
WB-3 Flow Monitoring Vault
Navy2 - Puget Sound Naval Shipyard
First Street Flow Monitoring Vault
bold - detected compound

Appendix F. OA, BNA, and Metals Scan Results - Bremerton, June 1999 (cont'd).

Location:	Navy1-1	Navy2-1
Type:	grab	grab
Date:	6/22	6/22
Time:	1012	1050
Lab Log#:	258242	258244
VOA Compounds (cont'd)	(ug/L)	(ug/L)
1,3-Dichloropropane	2 U	2 U
2-Hexanone	2 U	2 U
Tetrachloroethene	**0.6 J**	**0.26 J**
Dibromochloromethane	1 U	1 U
1,2-Dibromoethane (EDB)	1 U	1 U
Chlorobenzene	1 U	1 U
1,1,1,2-Tetrachloroethane	1 U	1 U
Ethylbenzene	**0.67 J**	1 U
m&p-Xylene	**1.8 J**	2 U
o-Xylene	**1.3**	1 U
Styrene (Ethenylbenzene)	1 U	1 U
Bromoform	1 U	1 U
Isopropylbenzene	1 U	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U
Trans-1,4-Dichloro-2-butene	5 U	5 U
1,2,3-Trichloropropane	2 U	2 U
Bromobenzene	1 U	1 U
n-Propylbenzene	**0.19 J**	1 U
2-Chlorotoluene	1 U	1 U
1,3,5-Trimethylbenzene	**0.61 J**	1 U
4-Chlorotoluene	1 U	1 U
tert-Butylbenzene	1 U	1 U
1,2,4-Trimethylbenzene	**1.9**	1 U
Pentachloroethane	2 U	2 U
sec-Butylbenzene	1 U	1 U
p-Isopropyltoluene	**11**	1 U
Butylbenzene		
1,3-Dichlorobenzene	1 U	1 U
1,4-Dichlorobenzene	**0.88 J**	**0.4 J**
n-Butylbenzene	**0.7 J**	1 U
1,2-Dichlorobenzene	1 U	1 U
Hexachloroethane	5 U	5 U
1,2-Dibromo-3-Chloropropane	2 U	2 U
1,2,4-Trichlorobenzene	2 U	2 U
Hexachlorobutadiene	1 U	1 U
Naphthalene	**5.2 J**	**1.6 J**
1,2,3-Trichlorobenzene	5 U	5 U

U - The analyte was not detected at or above the associated value .

J - The analyte was positively identified. The associated numerical value is an estimate.

Navy1 - Puget Sound Naval Shipyard WB-3 Flow Monitoring Vault

Navy2 - Puget Sound Naval Shipyard First Street Flow Monitoring Vault

bold -detected compound

grab -grab sample

Appendix F. OA, BNA, and Metals Scan Results - Bremerton, June 1999 (cont'd).

Location:	Navy1-E
Type:	comp
Date:	6/22-23
Time:	0800-0800
Lab Log#:	258241
BNA Compounds	(ug/L)
N-Nitrosodimethylamine	0.12 UJ
Pyridine	0.62 UJ
Aniline	0.12 UJ
Phenol	**1.1 J**
Bis(2-Chloroethyl)Ether	0.25 UJ
2-Chlorophenol	0.12 UJ
1,3-Dichlorobenzene	0.062 UJ
1,4-Dichlorobenzene	**0.35 J**
1,2-Dichlorobenzene	0.062 UJ
Benzyl Alcohol	**1.2 J**
2-Methylphenol	0.062 UJ
2,2'-Oxybis[1-chloropropane]	0.12 UJ
N-Nitroso-di-n-Propylamine	0.12 UJ
4-Methylphenol	**12 J**
Hexachloroethane	0.25 UJ
Nitrobenzene	0.12 UJ
Isophorone	0.12 UJ
2-Nitrophenol	0.12 UJ
2,4-Dimethylphenol	**0.49 J**
Bis(2-Chloroethoxy)Methane	0.12 UJ
Benzoic Acid	5 UJ
2,4-Dichlorophenol	0.12 UJ
1,2,4-Trichlorobenzene	0.12 UJ
Naphthalene	**0.48 J**
4-Chloroaniline	0.12 UJ
Hexachlorobutadiene	0.062 UJ
4-Chloro-3-Methylphenol	0.12 UJ
2-Methylnaphthalene	**0.33 J**
1-Methylnaphthalene	**0.28 J**
Hexachlorocyclopentadiene	0.12 UJ
2,4,6-Trichlorophenol	0.12 UJ
2,4,5-Trichlorophenol	0.12 UJ
2-Chloronaphthalene	0.062 UJ
2-Nitroaniline	0.12 UJ
Dimethyl Phthalate	**0.11 J**
2,6-Dinitrotoluene	0.12 UJ
Acenaphthylene	0.062 UJ
3-Nitroaniline	0.12 UJ
Acenaphthene	0.062 UJ

Appendix F. OA, BNA, and Metals Scan Results - Bremerton, June 1999 (cont'd).

Location:	Navy1-E
Type:	comp
Date:	6/22-23
Time:	0800-0800
Lab Log#:	258241
BNA Compounds (cont'd)	(ug/L)
2,4-Dinitrophenol	5 UJ
4-Nitrophenol	0.62 UJ
Dibenzofuran	0.062 UJ
2,4-Dinitrotoluene	0.062 UJ
Diethyl Phthalate	**3 J**
Fluorene	0.062 UJ
4-Chlorophenyl Phenylether	0.12 UJ
4-Nitroaniline	0.12 UJ
4,6-Dinitro-2-Methylphenol	5 UJ
N-Nitrosodiphenylamine	0.062 UJ
4-Bromophenyl Phenylether	0.12 UJ
Hexachlorobenzene	0.12 UJ
Pentachlorophenol	0.62 UJ
Phenanthrene	0.062 UJ
Anthracene	0.062 UJ
Caffeine	**12 J**
Carbazole	0.062 UJ
Di-n-Butyl Phthalate	**4.3 J**
Fluoranthene	0.062 UJ
Benzidine	0.12 UJ
Pyrene	0.062 UJ
Retene	0.062 UJ
Butylbenzyl Phthalate	**3.5 J**
Benzo(a)Anthracene	0.062 UJ
3,3'-Dichlorobenzidine	0.12 UJ
Chrysene	0.062 UJ
Bis(2-Ethylhexyl)Phthalate	**4.8 J**
Di-n-Octyl Phthalate	0.062 UJ
Benzo(b)Fluoranthene	0.062 UJ
Benzo(k)Fluoranthene	0.062 UJ
Benzo(a)Pyrene	0.062 UJ
3B-Coprostanol	1.2 UJ
Indeno(1,2,3-cd)Pyrene	0.062 UJ
Dibenzo(a,h)Anthracene	0.062 UJ
Benzo(g,h,i)Perylene	0.062 UJ

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the associated estimated value.

E - Ecology composite sample

grab - grab sample

comp - composite sample

bold - detected compound

Navy1 - Puget Sound Naval Shipyard WB-3 Flow Monitoring Vault

Navy2 - Puget Sound Naval Shipyard First Street Flow Monitoring Vault

Appendix F. OA, BNA, and Metals Scan Results - Bremerton, June 1999 (cont'd).

Location:	Eff-E	Navy1-E	Navy2-E	TrnsBlnk
Type:	comp	comp	comp	grab
Date:	6/22-23	6/22-23	6/22-23	6/21
Time:	0800-0800	0800-0800	0800-0800	1145
Lab Log#:	258236	258241	258243	258245
Metals	(ug/L) (Total Recoverable)	(ug/L) (Total)	(ug/L) (Total)	(ug/L) (Total)
Antimony	**0.66**	**2.6**	**1.8**	0.5 U
Arsenic	1 U	**2**	1.5 U	1 U
Pentavalent				
Trivalent				
Beryllium	0.5 U	1 U	1 U	0.5 U
Cadmium	0.5 U	1 U	1 U	0.5 U
Chromium	**3.0**			2.5 U
Hexavalent				
Trivalent				
Copper	**8.16**	**365**	**61.8**	**0.61**
Lead	0.5 UJ	**2.2**	**3.5**	0.5 UJ
Mercury (total)	0.03 U	0.15 U	0.10 U	0.03 U
Nickel	**8.02**	**41.1**	**4.8**	0.5 U
Selenium	1 UJ	1.5 U	1.5 U	1 UJ
Silver	**0.52**	**3.0**	1 U	0.5 U
Thallium	1 U	2 U	2 U	1 U
Tin	1 U	**16 J**	2 UJ	1 U
Zinc	**14.2 J**	**173**	**102**	5 UJ

Eff - Effluent

bold - detected value

Trnsblk - transfer blank

Navy1 - Puget Sound Naval Shipyard WB-3 Flow Monitoring Vault

Navy2 - Puget Sound Naval Shipyard First Street Monitoring Vault

* Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.

U - undetected

UJ - undetected at estimated detection level

Appendix G.

Glossary of Terms - Bremerton, June 1999

BOD_5 - biochemical oxygen demand
BNA - base-neutral acids (semivolatile organics)
Bremerton - Bremerton WWTP
comp - composite sample
E - Department of Ecology
Eff - effluent
EPA - United States Environmental Protection Agency
g - gram
grab - grab sample
Inf - influent
MF - membrane filter
mg - milligram
mg/L - milligram per liter
NPDES - National Pollutant Discharge Elimination System
pH - hydrogen ion concentration
PSNS - Puget Sound Naval Shipyard
QA - quality assurance
QC - quality control
Sludge - sludge sample from belt filter press
TIC - tentatively identified compound
TNVS - total nonvolatile solids
TNVSS - total nonvolatile suspended solids
TOC - total organic carbon
TS - total solids
TSS - total suspended solids
µg - microgram
VOA - volatile organic acid
WWTP - wastewater treatment plant